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13. ABSTRACT *(Maximum 200 words)*

Three students were recruited to and supported by this program. Two of these, Drs. David S. Brooks and wade S. Warren, have graduate with Ph.D. degrees. One Mr. Arjun Natesan, remains in PI Cassone's Lab. David S. Brooks graduate from Eastern Texas Baptist College (B.A. Biology) and received an M.S. in Plant Pathology from Texas A&M. He was an author or co-author on 5 publications which acknowledged AFOSR support. Further, he presented his research at the 1991 SRBR meeting in Amelia Island, FL. He defended his dissertation, entitled "Regulation of 2-[125]iodomelatonin binding in the chick brain by the circadian clock and development", in 1994 and is currently an Assistant Professor of Biology at LeTourneau Universityin Longview TX. Wade S. Warren received a B.S. degree in Biology from Louisiana College. He was an author or co-author on 5 publications that recognize AFOSR support. He has presented his research at the 1993 Society for Neurosciences and 1993 Society for Research on Biological Rhythms meetings. He defended his dissertation, entitled "The Sympathetic nervous system and the pineal gland: important components of the rat circadian systems", in 1995. Following graduation, Dr Warren moved to Georgia State Univeristy for post-doctoral research with Dr Timothy Bartness. He is currently Assistant Professor of Biology at Louisiana College.

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FINAL REPORT
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH
GRANT F49620-92-J-0238
"Graduate Student Training in Chronobiology"
Principal Investigator: Vincent M. Cassone
Texas A&M University

Objectives:

This augmentation award sought to train graduate students in the field of chronobiology. It took advantage of a concentration of circadian rhythm researchers studying diverse organisms and employing several experimental approaches to train students in a very multi-disciplinary environment. This training involved the following:

1) rotations among 4 rhythms laboratories: P.I. Cassone's, Dr. Susan Golden's, Dr. Paul Hardin's and Dr. David Earnest's labs.

2) weekly interdisciplinary journal club

3) annual participation in regional Southeastern and Central Texas Society for Clocks and national (Society for Neuroscience, Society for Research on Biological Rhythms, and/or Gordon Research Conferences for Chronobiology or Pineal Cell Biology)

4) formal training with courses in:
   a) ZOOL 602 "Biological Clocks" taught by PI Cassone
   b) BICH 431 "Molecular Genetics" taught by Biochemistry faculty
   c) ZOOL 434 "Behavioral and Regulatory Physiology" taught by PI Cassone
   d) Coursework in specialty areas of students' interests and/or weaknesses

Students were to be recruited nationally and, once matriculated, to participate in the Texas A&M Interdisciplinary Research Initiative in Clocks, administered by PI Cassone and Dr. Golden.

Status of Effort:

Three students were recruited to and supported by this program. Two of these, Drs. David S. Brooks and Wade S. Warren, have graduated with Ph.D. degrees. One, Mr. Arjun Natesan, remains in PI Cassone's lab.

David S. Brooks graduated from Eastern Texas Baptist College (B.A. Biology) and received an M.S. in Plant Pathology from Texas A&M. He was an author or co-author on 5 publications which acknowledged AFOSR support. Further, he presented his research at the 1991 SRBR meeting in Amelia Island, FL. He defended his dissertation, entitled "Regulation of 2-[^{125}I]iodomelatonin binding in the chick brain by the circadian clock and development", in 1994 and is currently an Assistant Professor of Biology at LeTourneau University in Longview TX.

Brooks Publications:

1) Cassone, V.M., **D.S. Brooks**, (1991) The sites of melatonin action in the house sparrow brain. J. Exp. Zool. 260: 302-309

2) **Brooks, D.S.**, V.M. Cassone (1992) Daily and circadian regulation of 2[^{125}I]iodomelatonin binding in the chick brain. Endocrinology 131: 1297-1304

3) Cassone, V.M., **D.S. Brooks**, D.B. Hodges, T.A. Kelm, J. Lu, W.S. Warren (1992) Integration of circadian and visual function in mammals and birds: brain imaging and the role of melatonin in biological clock regulation. In: Advances in Metabolic Mapping Techniques for Brain Imaging of Behavioral and Learning Functions. F. Gonzalez-Lima, T. Finkenstaedt and H. Scheich (eds) Kluwer Academic Publishers, Dordrecht/Boston/London, pp. 299-318.

4) Cassone, V.M., W.S. Warren, **D.S. Brooks** and J. Lu (1993) Melatonin, the pineal gland and circadian rhythms. J. Biol. Rhythms 8, Suppl.: S73-S81

5) V.M. Cassone, **D.S. Brooks**, and T.A. Kelm (1995) Comparative distribution of 2[^{125}I]iodomelatonin binding in the avian brain: outgroup analysis with turtles. Brain Behav. Evol. 45: 241-256

Wade S. Warren received a B.S. degree in Biology from Louisiana College. He was an author or co-author on 5 publications that recognize AFOSR support. He has presented his research at the 1993 Society for Neurosciences and 1993 Society for Research on Biological Rhythms meetings. He defended his dissertation, entitled "The sympathetic nervous system and the pineal gland: important components of the rat circadian system", in 1995. Following graduation, Dr. Warren moved to Georgia State University for post-doctoral research with Dr. Timothy Bartness. He is currently Assistant Professor of Biology at Louisiana College.

Warren Publications:

1) Cassone, V.M., D.S. Brooks, D.B. Hodges, T.A. Kelm, J. Lu, **W.S. Warren** (1992) Integration of circadian and visual function in mammals and birds: brain imaging and the role of melatonin in biological clock regulation. In: Advances in Metabolic Mapping Techniques for Brain Imaging of Behavioral and Learning Functions. F. Gonzalez-Lima, T. Finkenstaedt and H. Scheich (eds) Kluwer Academic Publishers, Dordrecht/Boston/London, pp. 299-318.

2) Cassone, V.M., **W.S. Warren**, D.S. Brooks and J. Lu (1993) Melatonin, the pineal gland and circadian rhythms. J. Biol. Rhythms 8, Suppl.: S73-S81

3) **Warren, W.S.**, D.B. Hodges, V.M. Cassone (1993) Pinealectomized rats entrain and phase-shift to melatonin injection in a dose-dependent manner. J. Biol. Rhythms 8: 233-245

4) **Warren, W.S.**, T.H. Champney and V.M. Cassone (1994) The suprachiasmatic nucleus controls circadian rhythms of heart-rate via the sympathetic nervous system. Physiol. Behav. 55: 1091-1099

5) **Warren, W.S.**, and V.M. Cassone (1995) The pineal gland, photoreception and coupling of behavioral, metabolic and cardiovascular circadian outputs. J. Biol. Rhythms 10: 64-79

Mr. Arjun Natesan received a B.S. in Chemistry from University of Chicago. He is currently a graduate student and is studying the molecular biology of the melatonin receptor in chick brain. He has developed a non-isotopic *in situ* hybridization technique for visualizing the melatonin receptors and the melatonin synthesizing enzyme N-acetyltransferase (NAT). He is currently working on details of this research before writing his first publication.

Interactions:

We are continuing our collaboration on NAT regulation with Dr. David C. Klein at NIH. In particular, we are analyzing the effect of superior cervical ganglionectomy on NAT mRNA rhythms.

New Discoveries or Patents:

In collaboration with Dr. David Earnest here at Texas A&M, we have transplanted fetal retina on the SCN of blinded rats. Several of these animals are entrained to the light:dark cycle. This exciting result is the focus of a renewal proposal in preparation for AFOSR.

Honors/Awards:

None